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PRINCIPAL INVESTIGATOR: Maria Hankerson  
Allen J. Taylor, LTC, MC

CONTRACTING ORGANIZATION: System Assessment & Research,  
Incorporated  
Lanham, Maryland 20706-2925

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13. ABSTRACT (Maximum 200 Words) <p>Electron beam computed tomography (EBCT) is a noninvasive x-ray test like a CAT scan that detects calcium in the arteries of the heart. When calcium deposits are present, they indicate that some build-up of arterial blockages has begun in the arteries. The available evidence on EBCT shows that patients with calcium deposits are more likely to develop heart problems, such as heart attacks. There is controversy, however, because it is not clear whether EBCT is more accurate than traditional risk factor measurements for predicting who is most likely to develop heart disease. Some of the controversy has arisen because EBCT is expensive (about \$500 per test). The test is also very sensitive, possibly too sensitive, meaning that many patients will have arterial abnormalities, but only some will ultimately experience problems with heart disease.</p> <p>Because of its promise and uncertainties, the Army needs to understand whether EBCT is a better way to screen our personnel than our current methods. This study, which will enroll 2000 active duty Army personnel (men and women) between the ages of 40 and 45, will answer 3 important questions about the utility of EBCT as a screening test in our active-duty troops:</p> <ol style="list-style-type: none"> <li>1. How common is coronary calcium in aged 40 to 45 year old active duty Army personnel? How does the expense and accuracy of an EBCT screening program compare to our current program of risk factor measurements?</li> <li>2. Does finding coronary calcium on an EBCT provide patients with better information to help guide them to healthier and happier lifestyles compared to our current measurements, like cholesterol? Are patients more motivated to eat right and exercise, for example, when they know they have early arterial blockages?</li> <li>3. Can we predict who will develop heart disease in the future better using an EBCT scan or a cholesterol measurement? Better predictions about heart disease risk will allow us to more accurately prescribe risk-reducing treatments like cholesterol medicines and aspirin.</li> </ol> <p>This study will help the Army understand the full implications of this new test, EBCT, on the cardiovascular health of our active-duty force. This knowledge will help guide the Army's application of this technology within the cardiovascular screening program.</p>				
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The purpose of the Army's cardiovascular screening program, initiated in 1981 and revised in 1989, was to reduce the incidence of sudden cardiac death associated with the mandatory semi-annual Army Physical Fitness Test. Despite mandatory screening for high risk individuals aged 40 years and older over the last decade, it does not appear that cardiovascular screening has had a major impact on sudden cardiac death of the middle aged U.S. Army soldier. This has prompted the Office of the Surgeon General, Department of the Army, to search for other screening tests for asymptomatic individuals. One such possibility is electron beam computed tomography (EBCT), which detects and quantifies coronary atherosclerotic burden in older populations through detection of coronary calcification. Civilian data, derived largely from selected, higher risk, and self-referred populations, are inadequate to assess the wide-scale application of this technology to lower risk individuals. To understand how EBCT might improve cardiovascular screening in the Army, the Prospective Army Coronary Calcium (PACC) study (a large, prospective, single center study) is investigating the relationship between EBCT findings, coronary risk behavior, and cardiovascular events, in young, asymptomatic U.S. Army personnel. This proposal focuses on evidence-based technology integration and preventive medicine. These aims have been endorsed by both the "Military Health Services System 2020 Report" and the Medical Research and Materiel Command "The Role of Technology in Reducing Health Care Costs" (MRMC white paper, October 1996) as major research initiatives for the future of military medicine.

**The PACC study is addressing the following objectives:**

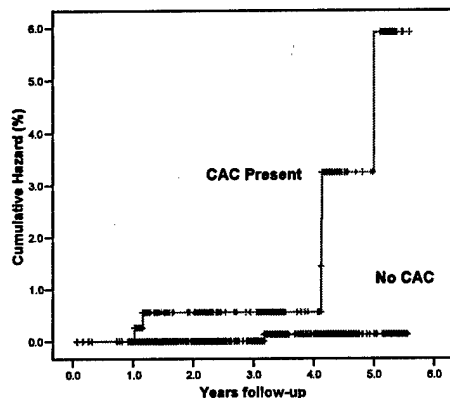
- 1) To determine the prevalence, extent, and cost implications of the diagnosis of coronary calcification in asymptomatic active-duty military 40- to 45- year-old men and women undergoing routine cardiovascular screening.
- 2) To assess the impact of EBCT results on several dimensions of patient behavior for coronary risk factor modification, and its interaction with the CVSP.
- 3) To establish the relationship between EBCT coronary calcification and cardiovascular events in an unselected, low-risk military population.

Recent literature continues to support the continuation of the current study protocol. The primary aim of this study, to compare EBCT and the Framingham index for their prognostic utility in coronary heart disease, remains unanswered within the current literature.

Enrollment of 2000 patients in the cohort study (the approval sample size) is complete, as previously reported. As such, since the last report, no additional participants have been enrolled. A total of 70 adverse events have been reported, none that were directly related to participation in the study. Each of these events represent natural history of coronary disease events, or evaluations for possible cardiac symptoms during the telephonic monitoring phase of the study.

Current effort focuses on tracking annual telephonic participant contacts and tracking patients for incident cardiovascular outcomes. As of this time, we have actuarial follow-up completed on 99.7% of the cohort, with a maximal follow-up time of 6 years. Present data on cardiovascular outcomes is discussed below:

The mean 10-year predicted CHD risk (Framingham) at the time of initial scanning was  $4.0 \pm 2.7\%$ . The prevalence of any detectable CAC was 19.4%. During 5.5 year actuarial follow-up, there were 8 hard CHD events (definite ACS or CHD death), including 7 of 388 individuals with CAC (1.8%) and 1 of 1612 without CAC (0.06%;  $P < .0001$  by log-rank). Cox regression showed that CAC was associated with a 22-fold increased risk for hard CHD ( $P = .004$ ) after controlling for the Framingham risk score.



These data extend the evidence supporting the independent predictive value of CAC for CHD outcomes to a younger, lower risk population. However, because of the low event rate in the overall population, even among those with CAC, avoiding unnecessary testing will require criteria that can optimally select low-risk individuals with the greatest likelihood of benefit from CAC screening.

The contract to SAR Inc. (employees handle data collection and management for the study) was renewed through MRMC as of August 2001 and is continuing. The contractor is dutifully executing the statement of work, and progress on the project is steady and continuous.

There have been no changes to the protocol during the past year.

#### Publications during August 2003- Current:

1. O'Malley PG, Greenberg BA, Taylor AJ. The cost effectiveness of scanning for coronary calcium: A decision analysis of screening EBCT's downstream costs. *Am Heart J.* 2004;148:106-113.
2. Flynn J, Taylor AJ, Jones DL, O'Malley PG. Correlation between psychological factors and motivation for healthy behavioral change. *Psychosomatics*, in press.
3. Tofferi JK, Taylor AJ, Feuerstein IM, O'Malley PG. Alcohol intake is not associated with subclinical coronary atherosclerosis. *Am Heart J*, in press.
4. Taylor AJ, Bindeman J, Bhattarai S, Feuerstein IM, O'Malley PG. Subclinical calcified atherosclerosis and its association with a family history of premature coronary heart disease in first and second-degree relatives. *Prev Cardiol*, in press.

5. Woods K, Taylor AJ, O'Malley PG. The relationship between depressive symptoms and systemic inflammation. *Psychosomatics*, in press.
6. O'Malley PG, Taylor AJ. Direct to consumer advertising and self referral for screening imaging services: A call to action. *Arch Int Med*, in press.
7. Bautista L, Taylor AJ, Atwood JE, O'Malley PG. Association between C-reactive protein and hypertension in healthy middle-aged men and women. *Coron Artery Dis*, 2004, in press.
8. Villines TC, Hatzigeorgiou C, Feuerstein I, O'Malley PG, Taylor AJ. Vitamin K intake and coronary calcification. Submitted.
9. Taylor AJ, Arora NS, Bindeman J, Bhattarai S, Feuerstein IM, O'Malley PG. Conventional, conditional, heredity, lifestyle, and psychosocial coronary risk factors: Relationships to subclinical atherosclerosis. In revision.
10. O'Malley PG, Siegman A, Feuerstein I, Taylor AJ. Anger and irritability are not associated with subclinical coronary artery disease. Submitted.
11. O'Malley PG, Hatzigeorgiou C, Feuerstein I, Bautista L, Taylor AJ. Anti-oxidant intake is not correlated with subclinical coronary artery disease. Submitted.
12. Taylor AJ. Integrating the results of atherosclerosis imaging into lipid management. Submitted.
13. Taylor AJ, Shaw LJ, Fayad Z, O'Leary D, Nissen S, Rader D, Raggi P. Tracking atherosclerosis regression: A clinical tool in preventive cardiology. Submitted.

#### **ABSTRACTS**

1. Taylor AJ, Bindeman J, Bhattarai S, Tan C, Feuerstein I, O'Malley PG. Family history of premature coronary heart disease and coronary disease risk: Do second degree relatives "count"? *Circulation* 2003; 108(17):IV-725.
2. O'Malley PF, Bindeman J, Bhattarai S, Taylor AJ. A randomized trial assessing the impact of cardiovascular risk factor case-management on the metabolic syndrome. *American Heart Association* 2004, in press.
3. Taylor AJ, Arora N, Bindeman J, Bhattarai S, Perron T, Feuerstein IM, O'Malley PG. What is the potential for coronary calcium to be a "self-fulfilling prophecy" for chest pain after screening coronary CT. Submitted.
4. Taylor AJ, Bindeman J, Bhattarai S, Perron T, Feuerstein IM, Brazaitis M, O'Malley PG. Coronary calcium is independently predictive of hard CHD outcomes in a young, unselected population: 5-year outcomes from the Prospective Army Coronary Calcium Project. Submitted.

**Key Research Accomplishments:**

- Continuation of actuarial follow-up with 99.7% success rate.
- Continued active publication record, with frequent scientific contributions.

**Reportable Outcomes**  
**Presentations and Publications: see above**



### Conclusions

The study is in its final phases, concentrating on telephonic tracking of the cohort for cardiovascular events. Preliminary data on cardiovascular events is being examined. Continued subgroup analyses on questions of interest within the approved dataset are continuing in this rich and productive dataset.